

Physics Curriculum Support Document

Projectile Motion: Background Information

Projectile Motion

Standard Course of Study Goals and Objectives

GOAL 1: The learner will develop abilities necessary to do and understand scientific inquiry.

1.02 Design and conduct scientific investigations to answer questions about the physical world.

- Create testable hypotheses.
- Identify variables.
- Use a control or comparison group when appropriate.
- Select and use appropriate measurement tools.
- Collect and record data.
- Organize data into charts and graphs.
- Analyze and interpret data.
- Communicate findings.

GOAL 3: The learner will build an understanding of two-dimensional motion including circular motion.

3.02 Design and conduct investigations of two-dimensional motion of objects.

3.03 Analyze and evaluate independence of the vector components of projectile motion.

Introduction to the Teacher

What Students should know after the lesson:

Students will analyze the motion of a basketball free-throw shot to identify the motion and forces acting on the ball. Using a videotaped image of the shot and frame-by frame analysis of the motion, students will look at the position of the ball in the vertical direction and in the horizontal direction. Using graphs of position vs. time in each direction, they will determine the type of motion and associate this motion with the models previously identified (constant velocity or constant force).

Materials

Materials will vary depending on the method you choose to determine the position of the ball as it changes over time. These instructions are written for video analysis of the motion. The program used is Scion, a PC program that can be downloaded for free from the Internet from Scion Corporation. A similar program is also available for Mac from NIH image. For Scion, the frames must be captured and saved as TIFF files. The image I used was a file called Basketball stack downloaded from the CIPE Program but you could video tape your own students to analyze. Another option would be to use programs for video capture such as Videograph and Videograb for Mac or World in Motion for PC. A third option would be to take measurements from a strobe photograph of a projectile (one such picture of a stream of water is in the Merrill textbook; another can be found at <http://www-personal.umich.edu/~jlhoffmn/physics/clpromo4.htm>).

These pictures can be scanned to digitize or downloaded to get them into a format that can be opened in Scion Image. A spreadsheet program such as Microsoft Excel can be